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Canadian Science Advisory Secretariat
Maritimes Region | Science Response 2016/039

# ASSESSMENT UPDATE OF BROWNS BANK NORTH SCALLOPS (*PLACOPECTEN MAGELLANICUS*)

## Context

Advice on the status of the Browns Bank North Scallop stock is requested annually by Fisheries and Aquaculture Management (FAM) to help determine a total allowable catch (TAC, meat weight) in support of the fishery. The purpose of this report is to update the status of Browns Bank North Scallop with data from the 2015 Scallop survey and fishery to provide science advice for the management of the 2016 fishery. The last peer-reviewed Regional Advisory Process for this stock occurred in 2013 (DFO 2013, Hubley et al. 2013) and updates were conducted in 2014 and 2015 (DFO 2014, DFO 2015).

The management of the main Scallop fishery on Browns Bank refers to the northern part of the Bank. Browns Bank South is a marginal growth area for Scallops and has separate management measures (Appendix 1). The assessment and advice presented in this document uses the assessment framework established in 2011 (Hubley et al. 2011) for Browns Bank North.

This Science Response reports results from the Science Response Process of April 6, 2016, on the Stock Status Update of Offshore Scallop: Browns Bank North and Georges Bank.

## Analysis and Response

The 2015 TAC was 750 t for Browns Bank North and total reported landings were 749 t (Figure 1). Based upon preliminary analysis of the 2015 fishery data and the annual stock survey data, an interim TAC of 500 t was set for the 2016 Browns Bank North fishery.

Science advice for this stock is provided using a Bayesian state-space modified delay difference assessment model that integrates both fishery and survey data and is described in Hubley et al. (2013). The model fit to the survey estimates of fully recruited (> 95 mm shell height) biomass, recruit (85-94.9 mm) biomass, and fishery catch per unit effort (CPUE; kg/(hour-meter)) are shown in Figure 2. Estimates of fully-recruited biomass in 2015 and projections of fully-recruited biomass for 2016 under various catch scenarios are presented for this stock (Figure 3 and Table 1).

The median fully-recruited biomass is estimated to be 4,684 t in 2015, which is below both the 2014 estimate (5,141 t) and the 24-year median biomass of 5,763 t (Figure 3). The median recruit biomass is estimated to be 782 t in 2015, an increase from the 2014 estimate (306 t), and above the 24-year median recruit biomass of 560 t.

The model's forecasted fully-recruited biomass for 2016 is 5,415 t; this forecast assumes:

1. a catch of 500 t (the interim TAC),
2. that condition in 2016 remains the unchanged from 2015 (15.0 g/dm$^3$), and
3. that natural mortality in 2016 will be unchanged from 2015 (0.06).



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This represents an estimated 15% increase in fully-recruited biomass from 2015 to 2016 (Table 1). Reference points have been proposed for the fishery (DFO 2012) but have not yet been adopted.

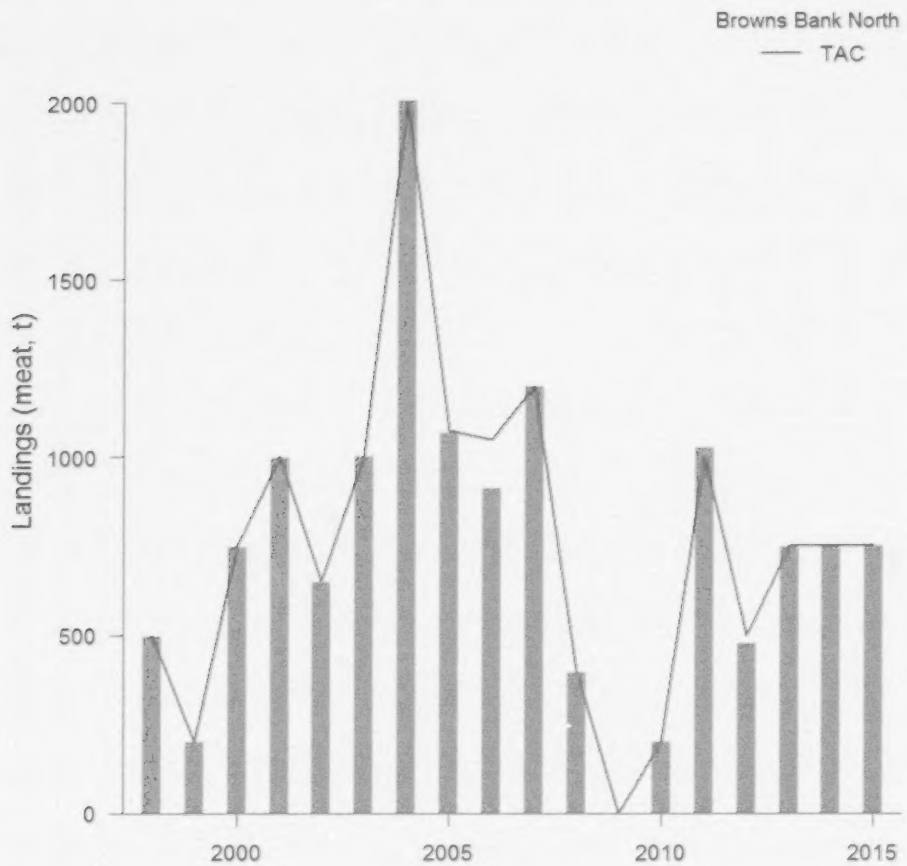


*Figure 1. Landings of Scallop meats (metric tons) from Browns Bank North between 1998 and 2015. The blue line represents total allowable catch (TAC), in metric tons. Prior to 1998, landings from Browns Bank North were combined with Browns Bank South.*

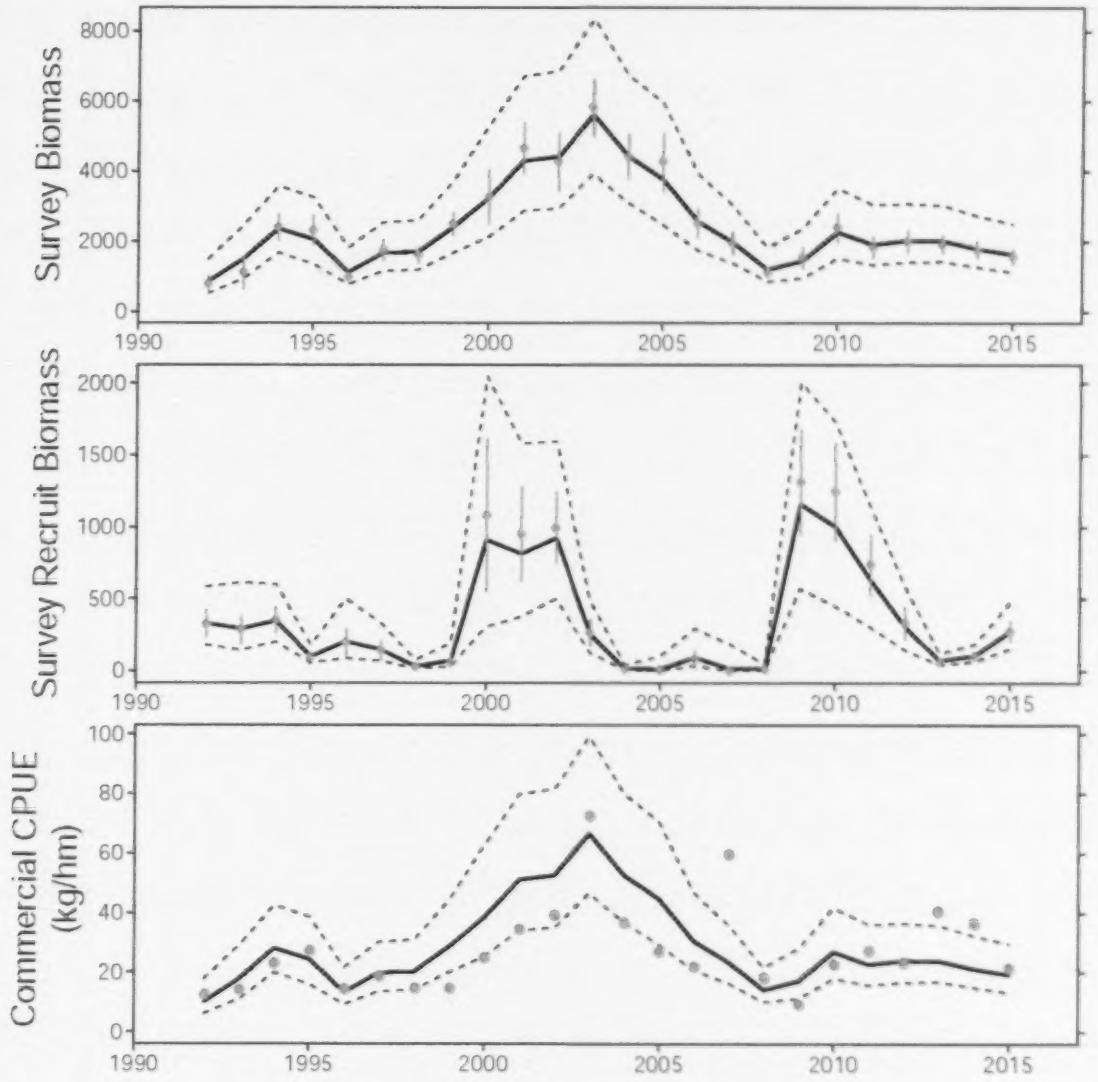


*Figure 2. Summary of model results and inputs for fully recruited survey biomass (top panel, in tonnes), recruit survey biomass (middle panel, in tonnes) and CPUE (bottom panel, in kg/hm) for Browns Bank North. The thick black line is the model estimate with 95% credible interval (dotted line). Circles represent observed values from the survey and the fishery. For the survey data, the vertical lines represent the standard error associated with the observed values.*

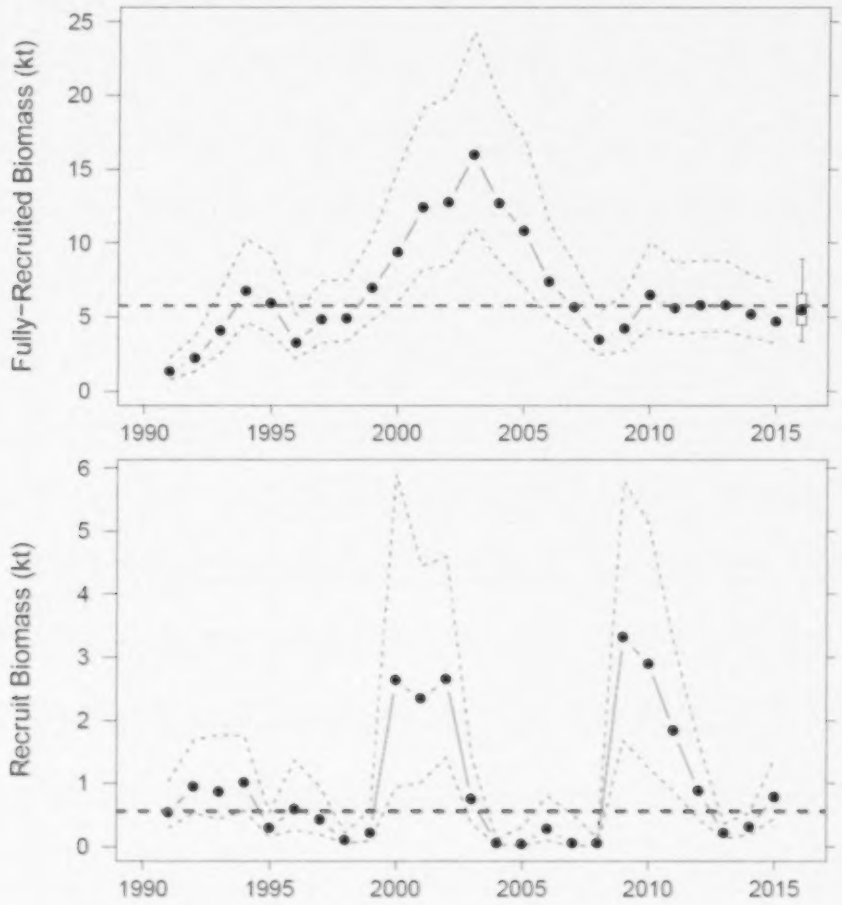


*Figure 3. Biomass estimates for fully-recruited (top panel) and recruit (lower panel) scallops from the stock assessment model fit to the Browns Bank North survey and commercial data. Dashed lines are the upper and lower 95% credible limits on the estimates. The blue horizontal dashed line represents the 24 year median (1991-2014). The forecasted fully recruited biomass for 2016, assuming a catch of 500 t, is displayed as a box plot with median (•), 50% credible limits (box) and 80% credible limits (whiskers).*

*Table 1. Catch scenarios for Browns Bank North in 2016 in terms of exploitation and expected changes in fully-recruited biomass. Potential catches in 2016 are evaluated in terms of the probability of a decline in biomass. These probabilities account for uncertainty in the biomass forecasts.*

| Catch (t) | Exploitation Rate | Probability of Biomass Decline | Expected Change in Biomass (%) |
|---|---|---|---|
| 200 | 0.05 | 0.25 | 22 |
| 300 | 0.07 | 0.28 | 19 |
| 400 | 0.08 | 0.30 | 17 |
| 500 | 0.10 | 0.32 | 15 |
| 600 | 0.12 | 0.35 | 12 |
| 700 | 0.13 | 0.37 | 10 |
| 800 | 0.15 | 0.40 | 8 |
| 900 | 0.17 | 0.43 | 6 |
| 1000 | 0.19 | 0.46 | 3 |
| 1100 | 0.20 | 0.49 | 1 |
| 1200 | 0.22 | 0.51 | -1 |

## Conclusions

The 2016 interim TAC of 500 t results in an exploitation rate of 0.10 and an expected increase in biomass (Table 1). Catch scenarios ranging from 200 t to 1,200 t were examined; scenarios with a catch of 1,100 t and below result in projected increases in fully-recruited biomass. The probability of biomass decline ranged from 0.25 (200 t) to 0.51 (1,200 t) while the change in biomass varied from 22% to -1% for the catch scenarios presented (Table 1).

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## Sources of Information

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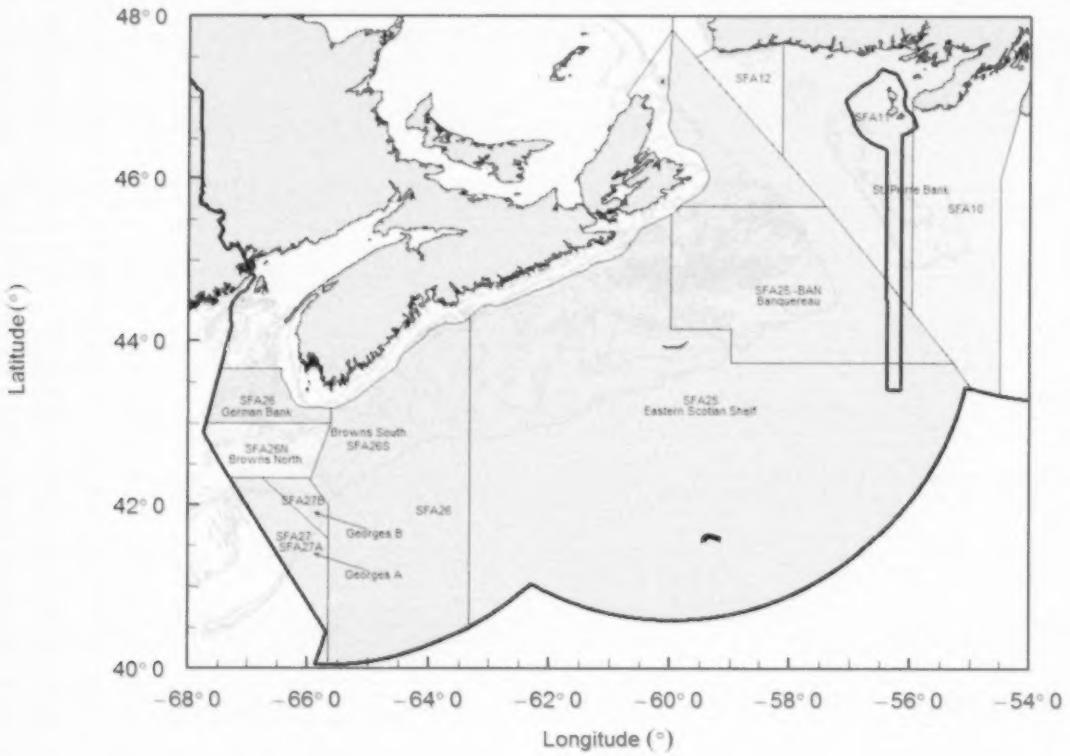
# Appendix

*Appendix 1. Map showing the offshore Scallop Fishing Areas (SFAs) 25-27 used for management purposes in the Maritimes Region. Note the division of Browns Bank North as a subarea of SFA 26.*



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